Georgia Tech Sponsored Research

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Project	E-20-F52	
Project director	Bergin	Michael
Research unit	CEE	
Title	Measurement of Aerosol Chemical and Radiative Properties in Nepal-	
Project date	9/30/2001	

Final Report for Period: 12/1999 - 09/2001 **Submitted on:** 07/25/2001

Principal Investigator: Bergin, Michael H. **Award ID:** 0096245

Organization: GA Tech Res Corp - GIT

Title:

Collaborative Research: Measurement of Aerosol Chemical and Radiative Properties in Nepal

Project Participants

Senior Personnel

Name: Bergin, Michael

Worked for more than 160 Hours: Yes

Contribution to Project:

Post-doc

Name: Carrico, Christian

Worked for more than 160 Hours: Yes

Contribution to Project:

Dr. Carrico has been responsible for the laboratory analyses of samples as well as the management and quality control of data. Dr. Carrico also made a trip to Nepal along with Dr. Bergin to meet colleagues associated with the project and to visit sampling locations.

Graduate Student

Undergraduate Student

Name: Parks, Kristen

Worked for more than 160 Hours: No

Contribution to Project:

Kristen has analyzed aerosol samples from Nepal in order to determine the concentrations of both elemental and organic carbon.

Research Experience for Undergraduates

Organizational Partners

University of New Hampshire

Dr. Jack Dibb at the University of New Hampshire is co-PI on the project.

Nepal Department of Hydrology and Met.

Dr. Arun Shrestha, from the Nepal Department of Hydrology and Meteorology, has been in charge of collecting samples in Nepal.

University of Paris

Dr. Laurent Gomes analyzed several aerosol samples using XRF to determine the concentrations of metals associated with wind-blown dust.

NOAA CMDL

Joyce Harris at NOAA CMDL has run both forward and backward air trajectories for 2 sites in Nepal to aid in our understanding of the link between source regions and aerosol loading in Nepal.

Other Collaborators or Contacts

The research has resulted in a few additional collaborations. Several samples collected in Nepal have been given to Dr. Glen Cass for analysis of specific organic compounds. It turns out that aerosol back trajectories done as part of the INDOEX experiment for the Malidive islands

indicate that often airmasses originated over the high Himalaya's. Dr. Cass intends to use the information to constrain transport models that will predict aerosol formation during Indoex.

In addition, we have been working with Dr. B.S.N. Prasad at the University of Mysore to study the relationship between aerosol levels in India and Nepal during our sampling time period.

Activities and Findings

Project Activities and Findings:

We established aerosol sampling sites at two sites in Nepal, one at Nagarkot in December, 1998 and the second at Langtang in early 1999. With the assistance of Dr. Arun Shresta (our primary collaborator at DHM), both stations were operated nearly continuously through 2000. At both stations we collected filter samples at 2-day resolution for quantification of soluble ionic species and organic aerosols (EC/OC analysis). At the Nagarkot station we also determined PM2.5 and PM10 mass at the same resolution, and measured aerosol optical depth with hand held sun photometers at least once per day (weather permitting). All analyses for more than 200 sample sets from Nagarkot are complete, with a similar number of optical depth measurements successfully obtained. Due to logistical difficulties, we have recently received the final shipment of filter samples from the Langtang site (approximately 100 filter sets), chemical analyses of these samples is in progress (and will soon be completed despite the funding period having ended).

Project Training and Development:

Aerosol loading and optical depth follow a pronounced seasonal pattern, controlled by circulation changes driven by the Indian monsoon. In the rainy season (June through September, and immediately afterward, the air is quite clean. Winds during this season are generally southerly (passing over India from the Bay of Bengal), so we suspect that precipitation scavenging is the primary explanation for the low aerosol loading. Concentrations of aerosols slowly increase from late October through January, with organic aerosols generally the dominant fraction of the mass, but with ammoniated sulfate also a major fraction. During the dry, dusty season in February through May (just before the monsoon rains) aerosol mass and optical depth often exceeded values measured in polluted urban areas. During this period, mineral dust is generally the dominant component of the aerosol. Trajectory analysis suggests that the source of mineral dust reaching Nepal is far to the west, with strong winds passing over northern Africa, and then the Arabian region enroute to the Indian subcontinent. Elemental analysis of a subset of filters collected during the dusty season at Nagarkot implicate the northern Sahara as the dominant source of mineral dust, with no evidence for significant inputs from the vast, and more proximal, deserts in Central Asia.

Research Training:

Through brief visits by the PIs to Nepal, but principally through the oversight of Dr. Shresta (who received his PhD at UNH shortly before this project began), we have trained several DHM employees in the sample handling and data 'book keeping' required to conduct a relatively long-term experiment. In addition, several on site 'observers' (station operators) were trained in the use and maintenance of our sampling equipment.

In addition the project has trained a postdoctoral researcher in the area of radiative influences of aerosols on climate. An undergraduate student has also been involved in the project and has learned, to a varying degree, about collecting and analyzing aerosol samples.

Outreach Activities:

The PI has given a lecture to undergraduate students studying chemistry at Carleton College on the impact of aerosols on climate. A large part of the seminar focused on measurements in Nepal.

Journal Publications

Books or Other One-time Publications

Web/Internet Site

URL(s):

http://www.ce.gatech.edu/~mhbergin

Description:

This site currently has a brief summary of the project and a presentation of initial results. The information at the site will be updated as the last samples from Nepal are analyzed.

Other Specific Products

Product Type: Conference Presentations/Proceedings

Product Description:

Dr. Christian Carrico (a post-doc working with MHB at GIT) has taken the lead on presenting initial results from this project at three international meetings. Abstracts have been published in the conference proceedings:

Carrico, C.M., M.H. Bergin, and A. Shresta, Annual variability of aerosol chemical, physical and radiative properties in Nepal, Spring AGU Western Pacific Geophysics meeting, Tokyo, Japan, June 2000.

Carrico, C.M., M.H. Bergin, and A. Shresta, Aerosol properties relevant to regional climate change in Nepal, American Association of Aerosol Research, Annual Conference, St. Louis, MO, October, 2000.

Carrico, C.M., L. Gomes, M.H. Bergin, A.B. Shresta, and J.E. Dibb, Analysis of trace species composition in relation to aerosol chemical and physical properties in the Nepal Himalaya, European Aerosol Conference, Leipzig, Germany, September, 2001.

We are also working on a manuscript intended for submission to JGR Atmospheres. A working draft has circulated to the co-authors, but we are hoping to include the complete data set from Langtang, so are waiting for the completion of the chemical analyses. At this stage the author list and tentative title are:

Carrico, C.M., M.H. Bergin, A.B. Shresta, J.E. Dibb, and L. Gomes, Aerosol Chemical and Optical Properties Measured in the Nepal Himalaya Relevant to Regional Climate Change.

Sharing Information:

We plan to give additional presentations at conferences and meetings. In addition, information will continue to be posted on the web page http://www.ce.gatech.edu/~mhbergin.

Contributions

Categories for which nothing is reported:

Any Journal

Any Book

Any Contribution

E-20-F52

Thelma Woods

From:
Sent: Wednesday, July 25, 2001 1:28 PM
To: fImail@nsf.gov; awardsnsf@osp.gatech.edu
Subject: Project Report Submitted - Award # 0096245

Award Number : 0096245
Report Type : Final Project Report ; Standard Grant

Report Number : 1824862
Report Period : 12/01/1999 to 09/30/2001
PI Name : Michael H Bergin

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PI has been notified by E-mail at address mike.bergin@